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DEVICE FOR PROTECTING AN INJECTION APPARATUS

The present invention relates to a protective device
for protecting apparatuses for injecting a product,
5 particularly for medical use, such a syringes.

In the description which follows the terms "proximal"
and "distal" are considered with respect to the
direction in which the product is injected.

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Product injection apparatuses such as syringes are well
known. Prefilled syringes are usually filled with a
drug before being distributed to the end-user.

15 However, the end-user is constantly exposed to the
risks of needle-stick injuries which are liable to
occur after injection.

In order to minimize these risks, it is known practice
20 for syringes to be equipped with a protective device in
the form of a sleeve that slides with respect to the
syringe and is supposed to cover the needle after
injection.

25 Some of these devices need to be fitted manually by the
end-user and are therefore rather unreliable. Other
protective devices are activated by a spring upon the
action of the end-user. In this case also, the
triggering of the protective device depends on an
30 action on the part of the end-user and is therefore
haphazard.

To overcome these disadvantages there are protective
devices that are activated automatically by a spring at
35 the end of injection. One of the problems encountered
with these devices is the risk of activating them
prematurely or inadvertently, particularly while they
are being manufactured and/or assembled with syringes.

There is therefore a need for a device for protecting a syringe that can be activated automatically but only at the end of injection or only when the end-user so decides.

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The objective of the invention is therefore to provide a device for protecting an injection apparatus, particularly a syringe, activated automatically at the end of injection but unable to be activated inadvertently, thus ensuring perfect safety against the risk of needle-stick injuries.

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The present invention relates to a device for protecting an injection apparatus for injecting a product, particularly a syringe, the said apparatus comprising a reservoir fitted with a needle at its distal end and a piston connected to an actuating rod surmounted by a piston head, the said device comprising:

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20 - a support sleeve comprising a body able to accommodate the injection apparatus and a proximal end part,

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 - a protective sleeve able to slide with respect to the support sleeve between a retracted standby configuration in which the needle is exposed and a deployed protective configuration in which it covers the needle,

 - the said device being characterized in that it comprises:

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 - first retaining means for holding the protective sleeve in its standby configuration in a first position, known as the injection position,

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 - second retaining means for holding the protective sleeve in its standby configuration in a second position, known as the end-of-injection position, which is appreciably offset in the distal direction with respect to the support sleeve,

 - an intermediate collar situated in the proximal end part of the support sleeve, able to slide with

respect to this support sleeve within the said proximal end part, the said collar comprising means of collaboration with the piston head of the injection apparatus, and means of deactivating the said first and
5 second retaining means,

- the said first retaining means being able to be deactivated by the said deactivation means of the said intermediate collar by pressure of the piston head in the distal direction on the said means of collaboration
10 of the said intermediate collar so as to cause the protective sleeve to slide in its retracted standby configuration between the said first injection position and the said second end-of-injection position,

- and the said second retaining means being able
15 to be deactivated by the deactivation means of the said intermediate collar by release of the pressure of the piston head on the said collaboration means of the said intermediate collar so as to allow the protective sleeve to deploy under the action of pushing means.

20 Advantageously, the means of collaboration of the intermediate collar with the piston head comprise two diametrically opposed legs running in the proximal direction, slightly offset from the body of the collar
25 in the radial direction and connected to the proximal end of the collar by radial bridges.

Advantageously, the first retaining means comprise two diametrically opposed longitudinal bulges formed on the
30 internal surface of the wall of the body of the support sleeve, each bulge at its proximal end comprising an internal retaining ramp and two first tabs running axially in the proximal direction from the proximal end of the protective sleeve, each of the said first tabs
35 being provided at its proximal end with a projection the distal face of which is inclined and able to rest on the internal ramp of the proximal end of one said bulge. Thus, the collaboration of the internal ramp of each bulge and of the distal surface of the projection

of the first tab facing the bulge holds the protective sleeve in its first, injection, position in its retracted standby configuration.

5 Advantageously, the second retaining means comprise a transverse retaining surface situated at the proximal end of each bulge facing the internal ramp of the said bulge and two second tabs running in the proximal
10 sleeve along an axis slightly inclined with respect to the longitudinal axis of the injection apparatus, each second tab being situated facing one said first tab, each second tab being equipped at its proximal end with a hooked portion the proximal face of which is able to
15 rest against the transverse retaining surface of the bulge facing it. Thus, the collaboration of the transverse surface of the proximal end of the bulge and of the proximal surface of the hooked portion of the second tab holds the protective sleeve in its second,
20 end-of-injection, position in its retracted standby configuration.

Advantageously, the deactivation means for deactivating the first and second retaining means are in the form of
25 a surface projecting radially from the body of the collar, the said surface being able to collaborate with the said first tabs and with the said second tabs to deflect them circumferentially.

30 Advantageously, the pushing means are in the form of a spring the proximal end of which bears against the distal end of the intermediate collar and the distal end of which bears against an annular rim formed on the internal surface of the protective sleeve at its
35 proximal end.

The attached figures illustrate, by way of example, one preferred embodiment of the device according to the invention.

Figure 1 is perspective view thereof;

Figure 2 is a perspective view thereof with the syringe
5 assembled;

Figure 3 is an exploded perspective view showing the
elements of the device according to the invention;

10 Figures 4 and 5 are side views of the device according
to the invention in its retracted standby configuration
in its first, injection, position, before and after
assembly of the syringe, respectively;

15 Figure 6 is a side view of the device of the invention
while the first retaining means are in the process of
being deactivated;

Figure 7 is a side view of the device according to the
20 invention in its retracted standby configuration in its
second, end-of-injection, position;

Figure 8 is a side view of the device according to the
invention while the second retaining means are in the
25 process of being deactivated;

Figure 9 is a side view of the device according to the
invention in its deployed protective configuration.

30 Figures 1 to 3 depict a device 1 for protecting an
injection apparatus. This device 1 comprises a support
sleeve 2 comprising a body 3 able to accommodate an
injection apparatus 4 such as the syringe shown in
figure 2 comprising a reservoir 32, a rod 33 for
35 actuating a piston, a piston head 19 and a cap 34
covering a needle (see Figure 6). The support sleeve 2
also comprises a proximal end part 5. The device 1 also
comprises a protective sleeve 6. This protective sleeve
6 is able to slide with respect to the support sleeve 2

between a retracted standby configuration in which the needle 7 of the injection apparatus 4 is exposed, as shown in Figure 6, and a deployed protective configuration in which the protective sleeve 6 covers the said needle 7 as shown in Figure 9.

As shown in Figures 1 and 2, the device 1 comprises first retaining means for holding the protective sleeve 6 in its standby configuration in a first position, known as the injection position, these being in the form of two longitudinal bulges 8 formed on the internal surface 9 of the wall of the body 3 of the support sleeve 2 and of two first tabs 10 running axially in the proximal direction from the proximal end 11 of the protective sleeve 6. As a preference, the bulges 8 are diametrically opposed. Each bulge 8 comprises, at its proximal end, an internal retaining ramp 12 and each first tab 10 is equipped at its proximal end with a projection 13 the distal face of which is inclined and able to rest on the internal ramp 12 of the proximal end of the bulge 8 facing it. As will be explained later on, these first retaining means for retaining the protective sleeve 6 are able to be deactivated in order to cause the protective sleeve 6 to slide, in its retracted standby configuration, between a first position known as the injection position and a second position known as the end-of-injection position.

As shown in Figure 2, the device 1 also comprises second retaining means for holding the protective sleeve 6 in its standby configuration in a second position, known as the end-of-injection position, these being in the form of a transverse retaining surface 14 situated at the proximal end of each bulge 8, facing the internal ramp 12 of the said bulge 8 and of two second tabs 15 running in the proximal direction from the proximal end 11 of the protective sleeve 6 along an axis slightly inclined with respect to the longitudinal

axis of the injection apparatus 4, each second tab 15 being situated facing one said first tab 10, each second tab 15 being equipped at its proximal end with a hooked portion 16 the distal face 17 of which is able
5 to rest on the transverse retaining surface 14 of the bulge 8 facing it. As will be explained later on, these second retaining means for retaining the protective sleeve 6 are able to be deactivated so as to allow the protective sleeve 6 to deploy at the end of injection.

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As is apparent from Figures 1 to 3, the protective device 1 also comprises an intermediate collar 18 situated in the proximal end part 5 of the support sleeve 2. The proximal end part 5 of the support sleeve
15 2 comprises tabs 29, each tab 29 comprising a radial hooked portion 30 intended to retain the proximal face of the intermediate collar 18 in the proximal direction, the said radial hooked portion 30 comprising an internal ramp 31 the function of which will be
20 explained later on. The intermediate collar 18 is able to slide with respect to the support sleeve 2 within the proximal end part 5 of this support sleeve 2. The intermediate collar 18 comprises collaboration means for collaborating with the piston head 19 of the
25 injection apparatus 4. In the example depicted, these collaboration means are in the form of two diametrically opposed legs 20 running in the proximal direction, slightly offset from the body 21 of the collar 18 in the radial direction and connected to the
30 proximal end of the collar 18 by radial bridges 22.

The intermediate collar 18 also comprises deactivation means for deactivating the first and second retaining means, these being in the form, in the example
35 depicted, of a surface 23 projecting radially from the body 21 of the collar 18, this surface 23 being able to cooperate with the said first tabs 10 and the said second tabs 15 to deflect them circumferentially. In the example depicted, this surface 23 has an external

ramp 24 facing each first tab 10 and a longitudinal recess 25 facing each second tab 15.

The protective device 1 also comprises at least one
5 pushing means in the form, in the example depicted, of
a spring 26 the proximal end of which bears against the
distal end 27 of the intermediate collar 18 and the
distal end of which bears against an annular rim 28
formed on the internal surface of the protective sleeve
10 6 at its proximal end 11.

In practice, the protective device 1 according to the
invention is in the storage position as depicted in
figure 4. The protective sleeve 6 has been inserted
15 within the support sleeve 2 until the respective distal
faces of the projections 13 of the first tabs 10 come
into contact with the respective internal retaining
ramps 12 of the bulges 8. Because they are slightly
inclined with respect to the longitudinal axis of the
20 device 1, the distal faces 17 of the hooked portions 16
of the second tab 15 are not in contact with the
transverse surfaces 14 of the bulges 8. Then the spring
26 is inserted, its distal end bearing against the
annular rim 28 of the protective sleeve 6. The
25 intermediate collar 18 is then inserted by pressing on
the internal ramps 31 of the radial hooked portions 30
of the tabs 29 which deflect as the said collar 18
passes. In the storage position, the intermediate
collar 18 is therefore clipped into the proximal end
30 part 5 of the support sleeve 2 by means of the tabs 29
and is retained in the proximal direction by the radial
hooked portion 30 of these tabs 29. The proximal end of
the spring 26 bears on the distal end 27 of the
intermediate collar 18. The system is thus perfectly
35 locked, with no risk of activation of the protective
sleeve being triggered. In this position, the injection
apparatus 4, in the form of a syringe in the example
depicted, is assembled as shown in Figure 5 and the
product contained in the syringe can be injected.

At the end of injection, as shown in Figure 6, the piston head 19 of the injection apparatus 4 comes into contact with the collaboration means, that is to say with the legs 20 in the example depicted, of the intermediate collar 18. By continuing to exert pressure and to push on the piston head 19, the intermediate collar 18 is moved in the distal direction and the external ramps 24 of the radially projecting surface 23 of the body 21 of the collar 18 deflect the first tabs 10 circumferentially. At the same time, the hooked portions 16 of the second tabs 15 are guided into the longitudinal recesses 25 of the radially projecting surface 23 of the body 21 of the intermediate collar 18 and the second tabs 15 are thus deflected circumferentially to come back parallel to the bulges 8.

Thus, the first retaining means for holding the protective sleeve 6 in its retracted standby configuration in the first, injection, position are deactivated and, under the pressure of the spring 26, the protective sleeve 6 is moved in the distal direction, over a short distance, until the distal faces 17 of the hooked portions 16 of the second tabs 15, guided by the longitudinal recesses 25, come into contact with the transverse retaining surfaces 14 of the bulges 8, as shown in Figure 7. The protective sleeve 6 is then in its retracted standby configuration in the second, end-of-injection, position. In this position, the protective device 1 is immobilized. The piston is at the end of its travel and it is not possible to trigger activation of the protective sleeve 6 by continuing to push on the piston head 19.

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To trigger activation of the protective sleeve, the user has to slightly release his pressure on the piston head 19. Thus, at this stage, the end-user may decide to activate the protective sleeve 6 while the needle 7

is still in the patient or may, on the other hand, decide to withdraw the needle 7 from the patient and then to activate the protective sleeve 6.

5 When the user slightly releases the pressure on the piston head 19, the intermediate collar 18 is moved in the proximal direction under the effect of the pushing of the spring 26. While this is happening, the surface 23 projecting radially from the body 21 of the collar
10 18 releases the second tabs 15 as shown in Figure 8. These second tabs 15 return to their initial position slightly inclined with respect to the longitudinal axis of the device 1 and the distal faces 17 of the hooked portions 16 no longer bear against the transverse
15 retaining surfaces 14 of the bulges 8.

Under the effect of the pushing of the spring 26, the protective sleeve 6 is then moved in the distal direction and covers the needle 7 (in chain line) as
20 shown in Figure 9.

It is evident from the foregoing that the invention provides decisive improvements to similar devices of the prior art by making it possible for the protective
25 sleeve to be activated only at the end of injection and at the time when the end-user so decides.

It goes without saying that the invention is not restricted to the embodiment described hereinabove by
30 way of example but that, on the contrary, it encompasses all alternative forms of embodiment that fall within the field of protection defined by the attached claims.